



TITLE:

# THE $\varphi$ -SEMI-COMPLETE MAXIMUM PRINCIPLE FOR REAL CONVOLUTION KERNELS(POTENTIAL THEORY AND ITS APPLICATIONS)

AUTHOR(S):

ITO, Masayuki

---

CITATION:

ITO, Masayuki. THE  $\varphi$ -SEMI-COMPLETE MAXIMUM PRINCIPLE FOR REAL CONVOLUTION KERNELS(POTENTIAL THEORY AND ITS APPLICATIONS). 数理解析研究所講究録 1983, 502: 37-45

ISSUE DATE:

1983-10

URL:

<http://hdl.handle.net/2433/103694>

RIGHT:

THE  $\varphi$ -SEMI-COMPLETE MAXIMUM PRINCIPLE

FOR REAL CONVOLUTION KERNELS

Masayuki ITÔ

伊藤 正之

1 - Let  $G$  be a locally compact, non-compact and  $\sigma$ -compact abelian group <sup>(1)</sup> and  $\varepsilon$  a fixed Haar measure on  $G$ . The potential-theoretic principles for positive convolution kernels play grand roles to the study of transient convolution semi-groups (see, for example, [3] and [8]). We know that the semi-transient convolution semi-groups are reasonable (see [6]) and that the semi-complete maximum principle for real convolution kernels have a very closed connection with them (see [4], [5] and [6]).

Let  $\varphi$  be a given non-negative continuous function on  $G$ . Similarly as in the semi-transient convolution semi-groups, we can define the  $\varphi$ -semi-transient convolution semi-groups, and similarly as in the semi-complete maximum principle, we can define the  $\varphi$ -semi-complete maximum principle.

Let  $(\alpha_t)_{t \geq 0}$  be a convolution semi-group on  $G$ . If  $\varphi \neq 0$  and  $(\alpha_t)_{t \geq 0}$  is  $\varphi$ -semi-transient and recurrent, then we shall obtain that  $\varphi$  is exponential <sup>(2)</sup> and that  $(\frac{1}{\varphi} \alpha_t)_{t \geq 0}$  is a semi-transient and recurrent convolution semi-group.

Let  $N$  be a real convolution kernel on  $G$  (i.e.,  $N$  is a real Radon measure on  $G$ ). If  $N$  satisfies the  $\varphi$ -semi-complete maximum principle (denoted by  $N \in \varphi$ -SCM), then, for any open set  $\omega \neq \emptyset$ , the reduced measure  $\eta_{N,\omega}^{(\varphi)}$  of  $N$  sur  $\omega$  with respect to  $(N, \varphi)$  is defined in the natural manner. In the connection with the recurrence of convolution semi-groups, it is important to examine the case of  $\eta_{N,\delta}^{(\varphi)} = -\infty$ , i.e., for any non-negative continuous function  $f \neq 0$  on  $G$  with compact support,

---

<sup>(1)</sup> We consider that  $G$  is an additive group.

<sup>(2)</sup> A continuous function  $\varphi$  on  $G$  is said to be exponential if for any  $x, y \in G$ ,  $\varphi(x + y) = \varphi(x)\varphi(y)$ .

$$\lim_{\substack{v \uparrow G \\ v \in \mathcal{U}}} \text{fd} \eta_{N, C_v}^{(\varphi)} = -\infty \quad (3),$$

where  $\mathcal{U}$  denotes the totality of compact neighborhoods of the origin 0.

THEOREM. Let  $N \in \mathcal{P}\text{-SCM}$ , and assume  $\varphi(0) = 1$  and that  $N$  is not pseudo-périodique <sup>(4)</sup>. If  $\eta_{N, \delta}^{(\varphi)} = -\infty$ , then we have (1) or (2):

(1)  $N$  is a Hunt convolution kernel and  $\varphi$  belongs to the closure of  $N$ -potentials  $N * f$  of non-negatives continuous functions  $f$  with compact support in the topology of compact convergence.

(2)  $\varphi$  is  $> 0$  and exponential, and  $\frac{1}{\varphi} N$  is of form

$$\frac{1}{\varphi} N = N_0 + \psi \xi,$$

where  $N_0$  is a convolution kernel of logarithmic type and  $\psi$  is an additive continuous function on  $G$ .

In theorem, (2) implies  $\eta_{N, \delta}^{(\varphi)} = -\infty$ , but we do not know if (1) implies  $\eta_{N, \delta}^{(\varphi)} = -\infty$ . Since (1) is not essential in the case of  $N \in \mathcal{P}\text{-SCM}$  and  $\eta_{N, \delta}^{(\varphi)} = -\infty$ , the relation between  $\mathcal{P}$ -semi-transient convolution semi-groups and the  $\mathcal{P}$ -semi-complete maximum principle for real convolution kernels is essentially reduced to that between semi-transient convolution semi-groups and the semi-complete maximum principle for real convolution kernels. This result will be suggestive when we discuss the "semi-transient diffusion semi-groups".

This note is a summary of our paper [7], and we shall omit all proofs in detail.

2 - We denote by

$C = C(G)$  the usual Fréchet space of finite continuous functions on  $G$ ,

$C_K = C_K(G)$  the usual topological vector space of finite continuous functions

---

<sup>(3)</sup> This means that for any sequence  $(v_n)_{n=1}^{\infty} \subset \mathcal{U}$  with  $\bar{v}_{n+1} \supset v_n$  and  $\bigcup_{n=1}^{\infty} v_n = G$ ,  $\lim_{n \rightarrow \infty} \int \text{fd} \eta_{N, C_{v_n}}^{(\varphi)} = -\infty$  (Remark that  $G$  is  $\sigma$ -compact).

<sup>(4)</sup> This means that, for any  $0 \neq x \in G$ ,  $N * \varepsilon_x$  is not proportional to  $N$ .

on  $G$  with compact support,

$M = M(G)$  the usual topological vector space of real Radon measures on  $G$

with the weak\* topology,

$M_K = M_K(G)$  the usual topological vector space of real Radon measures on  $G$

with compact support,

$C^+, C_K^+, M^+, M_K^+$  their subsets of non-negative elements.

Let  $(\alpha_t)_{t \geq 0}$  be a family in  $M^+$ . We say that  $(\alpha_t)_{t \geq 0}$  is a convolution semi-group on  $G$  if  $\alpha_0 = \varepsilon$ ,  $\alpha_t * \alpha_s = \alpha_{t+s}$  for any  $t \geq 0, s \geq 0$  and if  $t \rightarrow \alpha_t$  is continuous in  $M$ . Here  $\varepsilon$  denotes the unit measure at the origin  $0$ .

It is said to be transient (resp. recurrent) if for any  $f \in C_K^+$ ,  $\int_0^\infty dt \int f d\alpha_t < \infty$  (resp. if there exists  $f \in C_K^+$  such that  $\int_0^\infty dt \int f d\alpha_t = \infty$ ). It is said to be markovian (resp. submarkovian) if  $\int d\alpha_t = 1$  (resp.  $\int d\alpha_t \leq 1$ ). Let  $\varphi \in C^+$ .

A convolution semi-group  $(\alpha_t)_{t \geq 0}$  is said to be  $\varphi$ -semi-transient if for any  $\mu \in M_K$  with  $\varphi * \mu(0) = 0$ ,  $(\int_0^t \alpha_s * \mu ds)_{t \geq 0}$  is bounded in  $M$ . In particular, if  $\varphi \equiv 1$ ,  $(\alpha_t)_{t \geq 0}$  is said to be semi-transient.

**PROPOSITION 1.** Let  $\varphi \in C^+$  with  $\varphi \neq 0$  and  $(\alpha_t)_{t \geq 0}$  be a  $\varphi$ -semi-transient convolution semi-group on  $G$ . If  $(\alpha_t)_{t \geq 0}$  is recurrent, then  $\varphi$  is exponential,  $\varphi > 0$  on  $G$ ,  $(\frac{1}{\varphi} \alpha_t)_{t \geq 0}$  is a markovian convolution semi-group on  $G$  and it is semi-transient.

Hence, a convolution semi-group  $(\alpha_t)_{t \geq 0}$  is markovian if it is semi-transient and recurrent.

A real convolution kernel  $N$  on  $G$  is, by definition, of logarithmic type (resp. a Hunt convolution kernel) if for any  $\mu \in M_K$  with  $\int d\mu = 0$  (resp. for any  $\mu \in M_K^+$ ),  $N * \mu$  is of form

$$N * \mu = \int_0^\infty dt \alpha_t * \mu$$

(i.e., for any finite continuous function  $f$  with compact support,  $\int f dN * \mu = \lim_{a \rightarrow \infty} \int_0^a dt \int f d\alpha_t * \mu$ ), where  $(\alpha_t)_{t \geq 0}$  is a semi-transient and recurrent convolution semi-group (resp. a transient convolution semi-group).

3. - Let  $\varphi \in C^+$  and  $N_1, N_2$  two real convolution kernels on  $G$ . We denote by  $(N_1, N_2) \in \mathcal{P}\text{-SCM}$  if, for any  $f, g \in C_K^+$  with  $\varphi * f(0) = \varphi * g(0)$  and any  $a \in \mathbb{R}$ ,

$$N_1 * f \leq N_1 * g + a\varphi \text{ on } \text{supp}(f) \rightarrow N_2 * f \leq N_2 * g + a\varphi \text{ on } G,$$

where  $\mathbb{R}$  denotes the set of real numbers and  $\text{supp}(f)$  denotes the support of  $f$ . If  $N = N_1 = N_2$  and  $(N, N) \in \mathcal{P}\text{-SCM}$ , then we write simply  $N \in \mathcal{P}\text{-SCM}$  and we say that  $N$  satisfies the  $\mathcal{P}$ -semi-complete maximum principle. In particular, if  $\varphi \equiv 1$ , we write  $N \in \text{SCM}$  and we say that  $N$  satisfies the semi-complete maximum principle.

We denote by  $(N_1, N_2) \in \mathcal{P}\text{-SB}$  (resp.  $\in \mathcal{P}\text{-SB}_g$ ) if for any  $\mu \in M_K^+$  and any relatively compact open set  $\omega \neq \emptyset$  (resp. any open set  $\omega \neq \emptyset$ ), there exist  $\mu'_\omega \in M^+$  and  $a_{\mu, \omega} \in \mathbb{R}$  such that  $\text{supp}(\mu'_\omega) \subset \bar{\omega}$ ,  $\varphi * \mu'_\omega(0) = \varphi * \mu(0)$ ,  $N_1 * \mu'_\omega - a_{\mu, \omega} \varphi \leq N_2 * \mu$  and  $N_1 * \mu'_\omega - a_{\mu, \omega} \varphi = N_2 * \mu$  in  $\omega$ . If  $N = N_1 = N_2$  and  $(N, N) \in \mathcal{P}\text{-SB}$  (resp.  $\in \mathcal{P}\text{-SB}_g$ ), then we write simply  $N \in \mathcal{P}\text{-SB}$  (resp.  $\in \mathcal{P}\text{-SB}_g$ ) and we say that  $N$  satisfies the  $\mathcal{P}$ -semi-balayage principle (resp.  $N$  is  $\mathcal{P}$ -semi-balayable). In particular, if  $\varphi \equiv 1$ , we write  $N \in \text{SB}$  (resp.  $\in \text{SB}_g$ ) and we say that  $N$  satisfies the semi-balayage principle (resp.  $N$  is semi-balayable).

By using the usual dual methode (see, for example, [1]), we have the following

PROPOSITION 2. Let  $N$  be a real convolution kernel on  $G$  and  $\varphi \in C^+$ .

Then the following five statements are equivalent:

- (1)  $N \in \mathcal{P}\text{-SCM}$ .
- (2) For any positive number  $c$ ,  $(N + c\varphi, N) \in \mathcal{P}\text{-SCM}$ .
- (3)  $\check{N} \in \check{\mathcal{P}}\text{-SCM}$ .
- (4)  $N \in \mathcal{P}\text{-SB}$ .
- (5) For any positive number  $c$ ,  $(N + c\varphi, N) \in \mathcal{P}\text{-SB}$ .

For any function  $g$  on  $G$ , we put  $\check{g}(x) = g(-x)$  and denote by  $\check{N}$  the real convolution kernel defined by  $\int f d\check{N} = \int \check{f} dN$  for all  $f \in C_K$ .

From Proposition 2 follows the following

PROPOSITION 3. Let  $N \in \mathcal{P}$ -SCM. For a relatively compact open set  $\omega \neq \emptyset$  in  $G$ , there exist a family  $(V_{\omega,p})_{p>0}$  of universally measurable non-negative linear operators from  $M_K$  to  $M_b(\omega) = \{\mu \in M(G); \mu(C\omega) = 0\}$  and a family  $(g_{\omega,p})_{p>0}$  of universally measurable non-negative linear functionals on  $M_K$  such that:

(a) For any  $p > 0$  and any  $\mu \in M_K$ ,  $(pV_{\omega,p}\mu) * \mathcal{P}(0) = \mu * \mathcal{P}(0)$  and

$$(pN + \varepsilon) * V_{\omega,p}\mu - g_{\omega,p}(\mu)\mathcal{P}\xi = N * \mu \text{ in } \omega.$$

(b) For any  $p > 0, q > 0$  and any  $\mu \in M_K$ ,

$$V_{\omega,p}\mu - V_{\omega,q}\mu = (q - p)V_{\omega,p}(V_{\omega,q}\mu)$$

and

$$g_{\omega,p}(\mu) - g_{\omega,q}(\mu) = (q - p)g_{\omega,p}(V_{\omega,q}\mu) = (q - p)g_{\omega,q}(V_{\omega,p}\mu).$$

In this case,  $(V_{\omega,p}, g_{\omega,p})$  is uniquely determined for all  $p > 0$ .

Here  $V_{\omega,p}$  (resp.  $g_{\omega,p}$ ) is said to be universally measurable if for any  $f \in C_K$ , the function  $\int f dV_{\omega,p}\xi_x$  of  $x$  is universally measurable (resp. the function  $g_{\omega,p}(\xi_x)$  of  $x$  is universally measurable), where  $\xi_x$  denotes the unit measure at  $x$ .

For an open set  $\omega \neq \emptyset$  and  $\mu \in M_K^+$ , we put

$$P(N * \mu, \omega) = \overline{\{N * \nu; \nu \in M_K^+, \text{supp}(\nu) \subset \omega, \mathcal{P} * \nu(0) = \mathcal{P} * \mu(0)\}},$$

where the closure is in the sense of the weak\* topology, and

$$R(N * \mu, \omega) = \{\eta - a\mathcal{P}\xi; a \in \mathbb{R}, \eta - a\mathcal{P}\xi \leq N * \mu\}.$$

PROPOSITION 4. Let  $N \in \mathcal{P}\text{-SCM}$ . Then there exists the maximum element

$\eta_{N * \mu, \omega}^{(\varphi)} = \tilde{\eta}_{N * \mu, \omega}^{(\varphi)} - a_{\mu, \omega} \varphi$  in  $R(N * \mu, \omega)$ , where  $\tilde{\eta}_{N * \mu, \omega}^{(\varphi)} \in P(N * \mu, \omega)$  and  $a_{\mu, \omega} \in R$ , and  $\eta_{N * \mu, \omega}^{(\varphi)}$  and  $\tilde{\eta}_{N * \mu, \omega}^{(\varphi)}$  are uniquely determined.

We say that  $\eta_{N * \mu, \omega}^{(\varphi)}$  is the reduced measure of  $N * \mu$  on  $\omega$  with respect to  $(N, \varphi)$  and that  $\tilde{\eta}_{N * \mu, \omega}^{(\varphi)}$  is the pseudo-reduced measure of  $N * \mu$  on  $\omega$  with respect to  $(N, \varphi)$ .

Let  $N \in \mathcal{P}\text{-SCM}$  and  $(v_n)_{n=1}^{\infty} \subset U$  is an exhaustion of  $G$ , i.e.,  $\dot{v}_{n+1} \supset v_n$  and  $\bigcup_{n=1}^{\infty} v_n = G$ , where  $\dot{v}_{n+1}$  denotes the interior of  $v_{n+1}$ . Then  $(\eta_{N * \mu, C v_n}^{(\varphi)})_{n=1}^{\infty}$  is decreasing for all  $\mu \in M_K^+$  and  $\lim_{n \rightarrow \infty} \eta_{N * \mu, C v_n}^{(\varphi)}$  is a real Radon measure or for any  $0 \neq f \in C_K^+$ ,  $\lim_{n \rightarrow \infty} \int f d\eta_{N * \mu, C v_n}^{(\varphi)} = -\infty$ . Put

$$\eta_{N * \mu, \delta}^{(\varphi)} = \begin{cases} \lim_{n \rightarrow \infty} \eta_{N * \mu, C v_n}^{(\varphi)} & \text{if for } f \in C_K^+, \lim_{n \rightarrow \infty} \int f d\eta_{N * \mu, C v_n}^{(\varphi)} > -\infty \\ -\infty & \text{if for } 0 \neq f \in C_K^+, \lim_{n \rightarrow \infty} \int f d\eta_{N * \mu, C v_n}^{(\varphi)} = -\infty \end{cases};$$

then  $\eta_{N * \mu, \delta}^{(\varphi)}$  is independent from the choice of  $(v_n)_{n=1}^{\infty}$ .

Let  $B_K(\xi)$  be the space of bounded  $\xi$ -measurable functions on  $G$  with compact support and  $B_K^+(\xi)$  its subset of non-negative functions.

PROPOSITION 5. Let  $\varphi \in C^+$  with  $\varphi(0) > 0$ . Then  $\eta_{N, \delta}^{(\varphi)} = -\infty$  if and only if, for any  $g \in B_K^+(\xi)$ ,  $\eta_{N * (g\xi), \delta}^{(\varphi)} = -\infty$ .

PROPOSITION 6. Let  $\varphi \in C^+$  and  $N \in \mathcal{P}\text{-SCM}$ . If for any  $f \in B_K^+(\xi)$ ,  $\eta_{N * (f\xi), \delta}^{(\varphi)} \neq -\infty$ , then  $\eta_{N * (f\xi), \delta}^{(\varphi)}$  is absolutely continuous with respect to  $\xi$ . Denote by  $R_{\delta} f$  its density. Then

$$V_N : B_K(\xi) \ni f \rightarrow N * f - R_{\delta} f^+ + R_{\delta} f^-$$

satisfies the domination principle, i.e., for any  $f, g \in B_K^+(\xi)$ ,  $V_N f \leq V_N g$   $\xi$ -a.e. on  $\text{supp}(f\xi) \rightarrow V_N f \leq V_N g$   $\xi$ -a.e. on  $G$ . Here  $N * f$  denotes the density of  $N * (f\xi)$ .

In the case of  $\eta_{N * (f\xi), \delta}^{(\varphi)} \neq -\infty$  for all  $f \in B_K^+(\xi)$ , the  $\varphi$ -semi-complete maximum principle for  $N$  results principally from the domination principle for

$V_N$ . But we omit the precise discussion of this case.

PROPOSITION 7. Let  $N \in \mathcal{P}$ -SCM and assume that  $\gamma_N^{(\mathcal{P})} * (f\xi)_{,\delta} = -\infty$  for all  $0 \neq f \in B_K^+(\xi)$ . Then for an open exhaustion  $(\omega_n)_{n=1}^\infty$  of  $G$  <sup>(5)</sup> and any  $f \in B_K(\xi)$ ,  $\lim_{n \rightarrow \infty} V_{\omega_n, p}(f\xi)$  and  $\lim_{n \rightarrow \infty} g_{\omega_n, p}(f\xi)$  exist for all  $p > 0$ . Put

$$V_p(f\xi) = \lim_{n \rightarrow \infty} V_{\omega_n, p}(f\xi) \quad \text{and} \quad g_p(f\xi) = \lim_{n \rightarrow \infty} g_{\omega_n, p}(f\xi);$$

then, for any  $p > 0, q > 0$  and any  $f \in B_K(\xi)$ ,

$$(pN + \varepsilon) * V_p(f\xi) - g_p(f\xi)\mathcal{P}\xi = N * (f\xi), \quad V_p(f\xi) - V_q(f\xi) = (q - p)V_p(V_q(f\xi))$$

and

$$g_p(f\xi) - g_q(f\xi) = (q - p)g_p(V_q(f\xi)) = (q - p)g_q(V_p(f\xi)).$$

PROPOSITION 8. Let  $\mathcal{P} \in C^+$  with  $\mathcal{P}(0) = 1$  and  $N \in \mathcal{P}$ -SCM. If there exist  $g \in B_K^+(\xi)$  and an exhaustion  $(v_n)_{n=1}^\infty$  of  $G$  contained in  $\mathcal{U}$  such that  $\lim_{n \rightarrow \infty} \tilde{\gamma}_N^{(\mathcal{P})} * (g\xi)_{,Cv_n} = -\infty$  (i.e., for any  $0 \neq f \in C_K^+$ ,  $\lim_{n \rightarrow \infty} \int f d\tilde{\gamma}_{N, Cv_n}^{(\mathcal{P})} = -\infty$ ), then  $\mathcal{P}$  is exponential and for any  $p > 0$ ,  $V_p$  is a convolution kernel on  $G$ , i.e., there exists a positive Radon measure  $N_p$  on  $G$  such that for any  $\mu \in M_K^+$ ,  $V_p \mu = N_p * \mu$ .

For the proof of this proposition, we use the well-known Choquet-Deny theorem (see [2]) and the following lemma.

LEMMA 9. Under the same conditions in Proposition 8, we have, for any  $p > 0$  and  $\xi$ -almost all  $x \in G$  with  $\mathcal{P}(x) > 0$ ,

$$\check{\mathcal{P}}(x) = p \mathcal{P} * V_p \varepsilon_x(0).$$

<sup>(5)</sup> This means that  $\omega_n$  is a relatively compact open set,  $\overline{\omega_n} \subset \omega_{n+1}$  and  $\bigcup_{n=1}^\infty \omega_n = G$ .



PROPOSITION 10. Let  $\varphi \in C^+$  with  $\varphi(0) > 0$  and  $N \in \mathcal{P}\text{-SCM}$ . Assume that  $\eta_{N,\delta}^{(\varphi)} = -\infty$  and that  $(\tilde{\eta}_{N,Cv}^{(\varphi)})_{v \in \mathcal{V}}$  is bounded in  $M$ . Then, for any  $f \in B_K^+(\mathcal{E})$ ,  $V_p(f\mathcal{E}) \uparrow N * (f\mathcal{E})$  as  $p \downarrow 0$ .

4 - Our main theorem is followed from Proposition 8 and Proposition 10. Assume that  $(\tilde{\eta}_{N,Cv}^{(\varphi)})_{v \in \mathcal{V}}$  is unbounded. Then  $N \in \mathcal{P}\text{-SCM}$  shows that the hypothesis in Proposition 9 is verified. Applying théorème 2 in [5] to  $\frac{1}{\varphi} N$ , we have (2) in Theorem. In this case,  $\eta_{N,Cv}^{(\varphi)} = \tilde{\eta}_{N,Cv}^{(\varphi)}$  (see [4] or [5]). If  $(\tilde{\eta}_{N,Cv}^{(\varphi)})_{v \in \mathcal{V}}$  is bounded, Proposition 10 gives (1) in Theorem. Our Theorem, Proposition 8 and Proposition 9 give the following

COROLLARY 11. Let  $\varphi \in C^+$  with  $\varphi(0) = 1$  and  $N$  be a real convolution kernel on  $G$ . Then,  $N$  is of form in Theorem, (2), if and only if  $N \in \mathcal{P}\text{-SCM}$ ,  $N$  is not pseudo-periodic and  $\lim_{\substack{v \uparrow G \\ v \in \mathcal{V}}} \tilde{\eta}_{N,Cv}^{(\varphi)} = -\infty$ .

REFERENCES

- [1] C. BERG, Principe dual en théorie du potentiel, Bull. Soc. Math. France, 106, 1978.
- [2] G. CHOQUET and J. DENY, Sur l'équation de convolution  $\mu = \mu * \sigma$ , C. R. Acad. Sc. Paris, 250, 1960.
- [3] J. DENY, Noyaux de convolution de Hunt et noyaux associés à une famille fondamentale, Ann. Inst. Fourier, 12, 1962.
- [4] M. ITÔ, Une caractérisation des noyaux de convolution réels de type logarithmique, Nagoya Math. J., (to appear).
- [5] ———, Sur le principe semi-complet du maximum pour les noyaux de convolution réels, Nagoya Math. J., (to appear).
- [6] ———, Les noyaux de convolution de type logarithmique, (to appear in Lecture note in Math.).
- [7] ———, The  $\mathcal{P}$ -semi-complete maximum principle for real convolution kernels, (to appear).
- [8] G. A. HUNT, Markoff process and potentials, Illinois J. Math., 1 (1957), 2 (1958).
- [9] N. SUZUKI, Les résolvantes des noyaux continus réels vérifiant le principe semi-complet du maximum, Kôkyûroku Res. Inst. Sc. Math., Kyoto Univ., this volume.

Masayuki ITÔ

Department of Mathematics  
 Faculty of Sciences  
 Nagoya University  
 Furo-cho, chikusa-ku  
 Nagoya, 464, Japan